



Abandonment or survival? Understanding the future of *Castanea sativa* stands in function of local attitude (Northern Apennine, Italy)



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ABSTRACT

In a chestnut belt in the northern Apennines (Italy), we interviewed current (n = 52) and potential growers from a younger generation (n = 57), to assess what factors are likely to drive their willingness to continue chestnut culture. In 35 cases, local appraisals of chestnut stand disturbances were also contrasted with expert assessments. More than half of current growers were confident about the future of chestnut cultivation. This proportion decreased with grower's age and experienced issues, while slightly increased in presence of multifunctional management and support from family members. Although most growers resulted highly capable of diagnosing problems, expert advice significantly contributed to driving positive perceptions. About half of the younger interviewees also expressed interest in growing chestnut. This proportion was higher for respondents who are exposed to chestnut culture within the family, and who value cultural services above other ecosystem services (ES) of forests. Overall, passion for the activity and attachment to local heritage were the most influential motivation for both categories of respondents. We outline policy actions that may encourage the continuation of chestnut management and, more generally, conservation of cultural landscapes in mountain areas. Possible measures include financial incentives (e.g., payments for ES), tighter integration of traditional and expert knowledge in the production chain, and public recognition of the value of local heritage in land management. Broader support to maintaining services and infrastructure in rural areas, however, will also be a pre-condition.

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1. Introduction

Orchards and woods of *Castanea sativa* (Mill.) are a key component of the cultural and ecological memory of mountainous areas in Italy and the Mediterranean. Chestnut-dominated cultural landscapes date back to the later Roman times or early Middle Ages (Conedera et al., 2004a; Squatriti, 2013). Two or three millennia of co-evolution with humans have led to a strong imprint of chestnut on local identities and landscapes, as for example evidenced by numerous toponyms (Cherubini, 1981). Chestnut woodlands or chestnut-dominated landscapes can be considered

social-ecological systems (Berkes and Folke, 1998) or biocultural landscapes (Davidson-Hunt et al., 2012; Gavin et al., 2015), where human management and environmental factors have interacted and co-evolved for a long period of time. Such a tight intertwining is often codified in local or traditional knowledge (Berkes, 1999), and constitutes the basis for many chestnut habitats (Pezzi et al., 2011). The expression “chestnut civilization” is often used to indicate this social-ecological or biocultural link in Italy and the Mediterranean (Gabrielli, 1994; Michon, 2011).

In Italy, chestnut woodlands compose a broad matrix that spans over the entire Apennine and Alpine ranges. Chestnut-dominated forests amount to some 788,408 ha (Gasparini and Tabacchi, 2011), corresponding to 9% of the whole Italian wooded surface. This represents a substantial biological and cultural heritage, whose conservation importance is recognized at the European level, since chestnut forest is a “habitat of Community interest” (Habitat Directive 92/43/EEC). Yet, its successful conservation into the future

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poses a number of challenges. Not only are chestnut dynamics affected by abiotic and biotic factors, with the latter ones becoming particularly relevant in the lack of active management (e.g. Romane et al., 1995; Conedera et al., 2000, 2001; Gondard et al., 2001; Paci et al., 2003; Pezzi et al., 2010; Pividori et al., 2006; Zlatanov et al., 2013; Müllerová et al., 2015). Many chestnut groves are strictly dependent on human use (Conedera et al., 2004b; Michon, 2011), so that their conservation is subordinated to a range of anthropogenic variables. Maintenance, recovery, or abandonment choices can be influenced by socio-economic and policy contexts, but also by sense of cultural identity and bond to the land (Conedera et al., 2004a; MIPAAF, 2010). Rural abandonment in the last century has affected many areas of Italy especially in the Apennines, with negative repercussions on the management of chestnut stands (Arnaud et al., 1997). Other factors influencing management choices include: market trends, labor and land costs, international as well as local regulations that affect funding availability, changes in lifestyle of mountain populations, and structural factors, such as the high fragmentation of land property. As a result, only 66,539 ha are presently cultivated as chestnut orchards in all of Italy, compared to 610,000 ha reported at the beginning of the 20th century (Vigiani, 1908).

Disturbances (i.e. fauna, pathogens, pests) may not influence only the perceptions and attitudes of growers towards chestnut cultivation but may also have direct impact on the orchards and woods. (Turchetti et al., 2012; Maresi et al., 2015). At the beginning of the 20th century, the spread of ink disease (caused by *Phytophthora cambivora* [Petri] Buism.) introduced great worries about the future of chestnut cultivation. About fifty years later, chestnut blight (*Cryphonectria parasitica* [Murr.] Barr) hit chestnuts in the whole country, generating similar preoccupations and contributing to the abandonment of many mountain areas. The recent damages caused by Asian Chestnut Gall Wasp (*Dryocosmus kuriphilus* Yasumatsu; hereafter ACGW) have renewed the concerns about the future of the cultivation. Such concerns are especially spread among growers who have been involved in processes of recovery that followed the positive evolution of blight epidemics with clear predominance of hypovirulence (Turchetti et al., 2008). Extreme weather fluctuations, leading to alternating episodes of drought and excess rainfall, have also negatively affected chestnut production over the last few years (Pereira et al., 2011). The occurrence of similar perturbations and epidemics from alien pathogens can be expected to intensify in a world that becomes increasingly “anthropogenic” and inhabited by novel assemblages (Hobbs et al., 2006). This requires strategies to cope with environmental change and unpredictability, leveraging the potential for adaptive learning of both traditional and scientific knowledge (Berkes et al., 2000).

Because conservation of chestnut heritage largely depends on continuation of human management, it is crucial to understand what factors may drive or hinder the willingness to engage with this activity into the future. Here, we use structured interviews to examine the perceptions of current chestnut growers and younger generations (those who might eventually take over the activity) in a representative “chestnut economy” of Northern Italy. We take expert assessments of the state of chestnut stands as a reference against which to compare current growers’ perceptions, and discuss our findings with attention to their policy implications. We hypothesize that current growers’ outlook about the future may be determined by the characteristics of the stands they manage, and considerations about the profitability of the activity. We also expect that phytosanitary issues affecting the stands may have a negative influence on those outlooks, and that this may be accrued by difficulties in diagnosing the problems. Similarly, we expect that a majority of the younger interviewees may not be interested in

chestnut work, perceiving the activity as overly demanding and not sufficiently rewarding in economic terms.

2. Material and methods

2.1. Study area

Our study focused on a chestnut belt (44°20′41″N, 10°59′42″E) in the Northern Apennines, Italy (Fig. 1). The belt ranges across the municipalities of Guiglia, Zocca, and Montese in the Modena Province, and covers about 2419 ha (altitudinal range: 300–1000 m a.s.l.). Chestnuts in the area are managed as orchards (ca. 7% of chestnut area), irregularly managed stands (9%), and especially coppices (84%). Chestnut woods are mostly north-exposed and part of a mosaic of agricultural patches, forests, meadows, and scrublands. Agricultural uses include orchards and vineyards in hilly areas, and potato at higher altitudes. Fodder and cereals are also widespread, and largely used for the dairy industry. Wooded areas mainly consist of mixed deciduous broad-leaved forests managed as coppice and located where slopes are too steep for agriculture (Corticelli et al., 2004).

The management status of chestnut woods is the result of contrasting trends: general abandonment after World War II, and renewed interest that has led to reconverting some coppices into orchards since the 1980s (Pelleri and Antonaroli, 1986). This interest has focused in particular on production of *marroni*, a more appreciated fruit for human consumption than nuts, which has been object of valorization policies and is currently marketed under a trademark. Coppices, in contrast, are mainly managed for firewood and poles. In the last two decades, multifunctional uses of chestnut woods have also gained importance, including tourism, and educational and recreational activities. Chestnuts in the area, however, remain threatened by ink disease, chestnut blight, ACGW, and extreme weather events. Ink disease has probably been present since early 20th century, with the most recent outbreaks being reported in the early 1990s (Ambrosini et al., 1997). Blight was recorded in 1950–60s, but hypovirulence was stabilized by the end of the 1980s (Turchetti, pers. comm.). ACGW was firstly reported in 2009, and the parasitoid *Torymus sinensis* was introduced in 2011 (Vai et al., 2014). We chose this area as our focus because of its long history of chestnut cultivation and recent trend of rural agricultural abandonment.

2.2. Data collection

2.2.1. Interviews

To investigate possible factors affecting chestnut management into the future, we conducted structured interviews with two distinct target groups in the area: current chestnut growers, and 18–35 years old people, whom we considered as potential growers.

To identify possible respondents, we first relied on previous contacts in the area, local networks and associations, and public events, such as rural fairs, and then added new contacts via snowball sampling (Hislop et al., 2004). For both target groups, we stopped when we did not find any more potential respondents or new respondents refused to answer, and after our sample had grown sufficiently large to enable the intended statistical analyses (≥ 30). Current growers were contacted either in person (for example at rural fairs) or by telephone. Young people were contacted either in person or via email/social networks. Contact with prospect interviewees was facilitated by one of the authors, who is a native resident in the study area. Interviews were carried out in different sessions between Summer 2013 and Fall 2015.

Following exploratory conversations with key informants, which allowed obtaining a first picture of the major concerns

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